Replacement Sheet

S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.

Title: Send by Reference in a Customizable, Tag-based Protocol
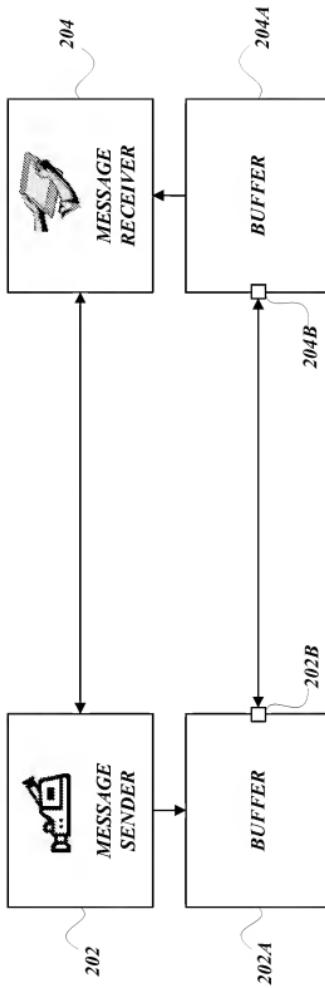
1/16

100

MESSAGE SENDER

102
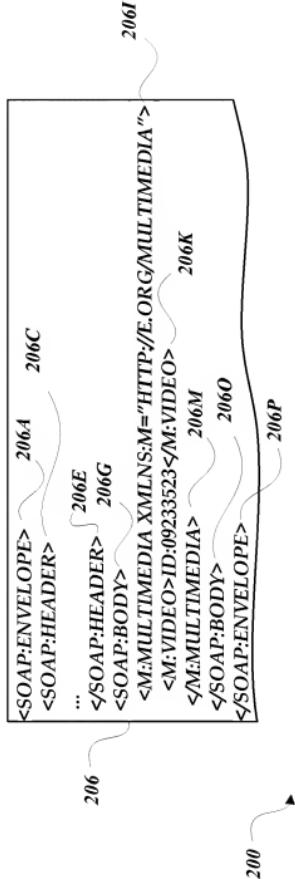
106

```
<SOAP:ENVELOPE>      106A
  <SOAP:HEADER>      106C
  ...                106E
  </SOAP:HEADER>     106F
  <SOAP:BODY>
  ...                106H
  </SOAP:BODY>
</SOAP:ENVELOPE>     106J
```

MESSAGE RECEIVER

104

Fig.1.

(PRIOR ART)

```
<SOAP:ENVELOPE>                    206A      206C
  <SOAP:HEADER>
    ...                      206E
  </SOAP:HEADER>             206G
  <SOAP:BODY>
    <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">
      <M:VIDEO>ID:09233523</M:VIDEO>        206K
    </M:MULTIMEDIA>       206M
  </SOAP:BODY>          206O
</SOAP:ENVELOPE>      206P
```

206 ▲

206I

Fig.2A.

```
<SOAP:ENVELOPE>
  <SOAP:HEADER>
    ...
  </SOAP:HEADER>
  <SOAP:BODY>
    <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">
      <M:VIDEO>ID:09233523</M:VIDEO>
      <M:MEDIA>
      </M:MEDIA>
    </M:MULTIMEDIA>
  </SOAP:BODY>
</SOAP:ENVELOPE>
```

Fig.2B.

```
<SOAP:ENVELOPE>
    <SOAP:HEADER>
        <R:BUFFER ID="ID1"/>
        <R:ENDPOINT>ID:0923352B</R:ENDPOINT>
    </R:BUFFER>
    </SOAP:HEADER>
    <SOAP:BODY>
        <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA"/>
            <M:VIDEO HREF="#ID1'/>
        </M:MULTIMEDIA>
    </SOAP:BODY>
</SOAP:ENVELOPE>
```
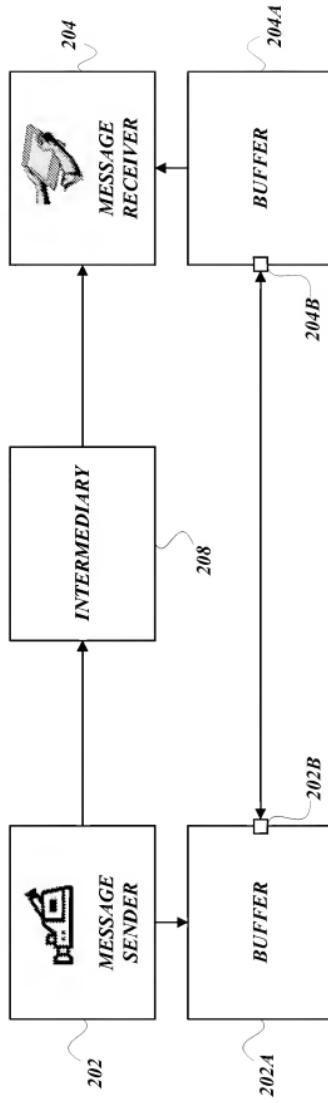

Fig.2C.

Replacement Sheet

S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.

Title: Send by Reference in a Customizable, Tag-based Protocol

5/16

```
<SOAP:ENVELOPE XMLNS:S="HTTP://WWW.W3.ORG/2003/05/SOAP-ENVELOPE">          302
  <SOAP:HEADER>                                                           304
    <R:RDMA XMLNS:R="HTTP://MAGNET/CONTRACTS/2003/08/RDMA.XSD">           306
      <R:SERVICEINFO SERVICE="RDMAP/0923523-345B-4351-B623-5D5E35SG55D6">  308
        <R:HOST>EXAMPLE.COM</R:HOST>                                      310
        <R:PROTOCOL>6</R:PROTOCOL>                                        312
        <R:PORT>808</R:PORT>                                              314
        <R:CONTRACT>HTTP://EXAMPLE.ORG/RDMA/READ</R:CONTRACT>             316
        <R:TAG>983452346</R:TAG>                                          318
        <R:LENGTH>231245646</R:LENGTH>                                    320
      </R:SERVICEINFO>                                                    322
    </R:RDMA>                                                            324
  </SOAP:HEADER>                                                          326
  <SOAP:BODY>                                                             328
    <M:MULTIMEDIA XMLNS:M="HTTP://EXAMPLE.ORG/MULTIMEDIA">                330
      <M:VIDEO>RDMAP/0923523-345B-4351-B623-5D5E35SG55D6</M:VIDEO>        332
    </M:MULTIMEDIA>                                                       334
  </SOAP:BODY>                                                            336
</SOAP:ENVELOPE>                                                          338
```
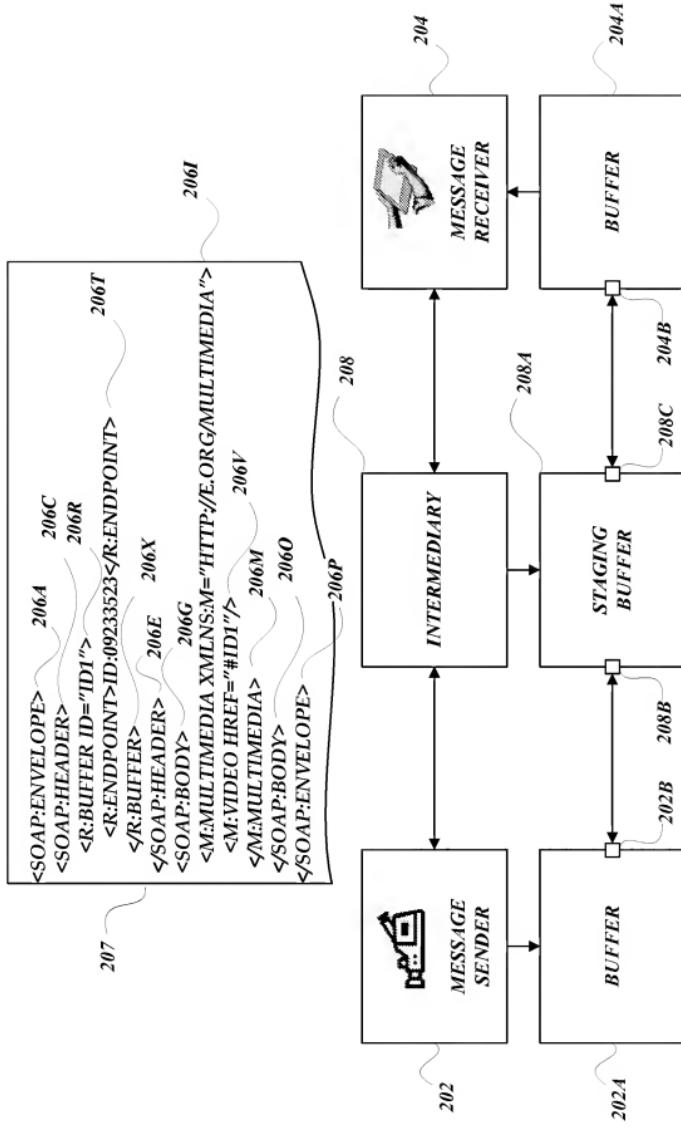
300

Fig.3.

Fig.4A.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

7/16

Fig.4B.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

8/16

**START A METHOD FOR
SENDING BY REFERENCE IN A CUSTOMIZABLE,
TAG-BASED PROTOCOL**

500

(A)

*A SENDER SERVICE PREPARES A MESSAGE
WITH ONE OR MORE REFERENCES TO ONE
OR MORE BUFFERS (SEE FIGS. 5B-5D)*

502

(B)

(C)

*AN INTERMEDIATE NODE PROCESSES THE
MESSAGE WITH ONE OR MORE REFERENCES
TO ONE OR MORE BUFFERS (SEE FIGS. 5E-
5F)*

504

(D)

(E)

*A RECEIVER SERVICE PROCESSES THE
MESSAGE WITH ONE OR MORE REFERENCES
TO ONE OR MORE BUFFERS (SEE FIGS. 5G-5I)*

506

(F)

Fig.5A.

(FINISH)

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

9/16

500

(A)

A SENDER SERVICE AT A FIRST NODE
FINDS A SESSION MANAGER SERVICE
FROM A DIRECTORY — 508

THE SENDER SERVICE ISSUES A
CREATE TRANSFER SESSION
REQUEST TO THE SESSION
MANAGER SERVICE — 510

THE CREATE TRANSFER SESSION REQUEST IS
SENT ALONG WITH PARAMETERS IDENTIFYING
THE URI OF THE RECEIVER SERVICE AT A
SECOND NODE — 512

THE SESSION MANAGER SERVICE RECEIVES THE
CREATE TRANSFER SESSION REQUEST ALONG WITH
PARAMETERS IDENTIFYING THE URI OF THE
RECEIVER SERVICE — 514

THE SESSION MANAGER
ISSUES A MAPPING
REQUEST TO A NETWORK
MANAGER — 516

THE MAPPING REQUEST IS SENT
ALONG WITH THE URI OF THE
RECEIVER SERVICE AND AN ADDRESS
OF A LOCAL BUFFER — 518

THE NETWORK MANAGER PASSES THE
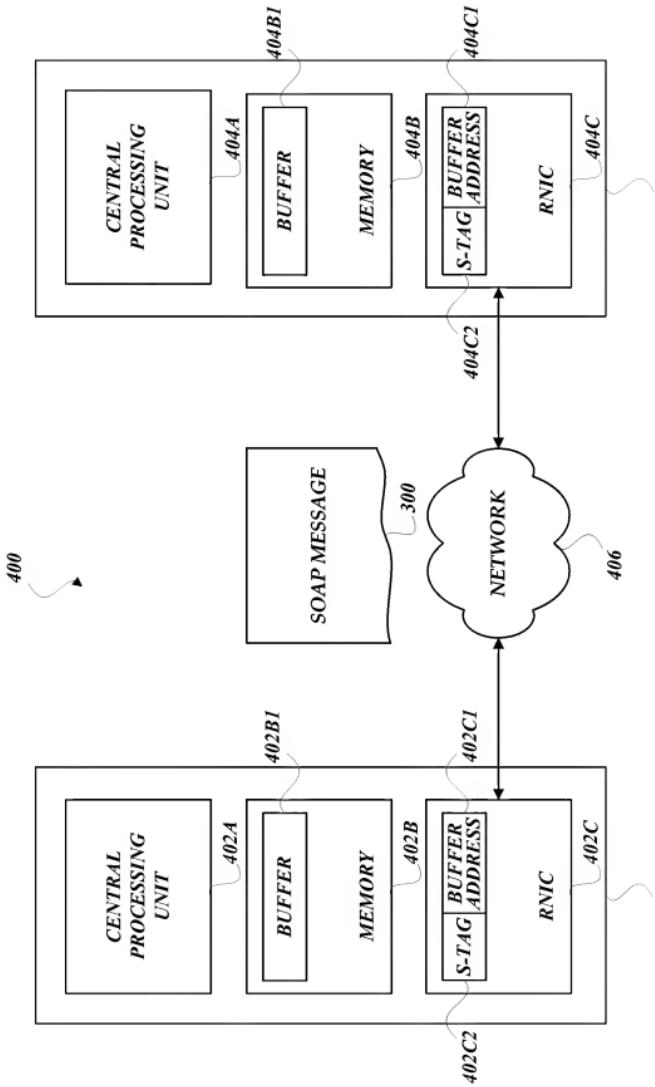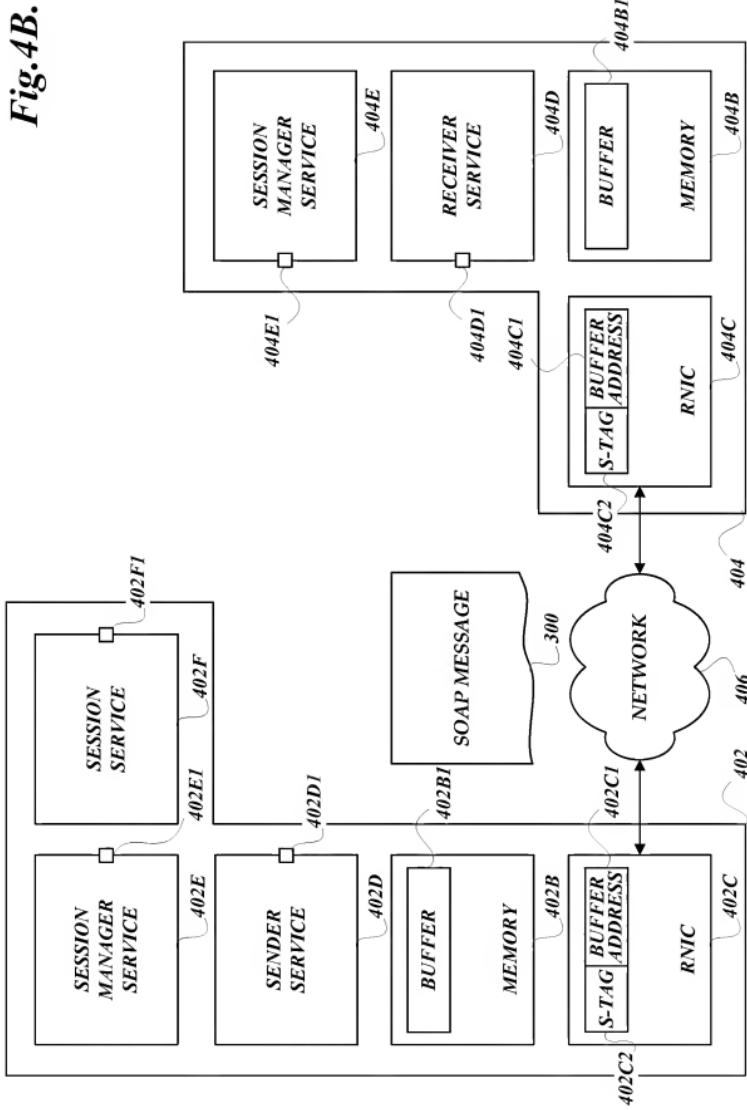ADDRESS OF THE LOCAL BUFFER TO
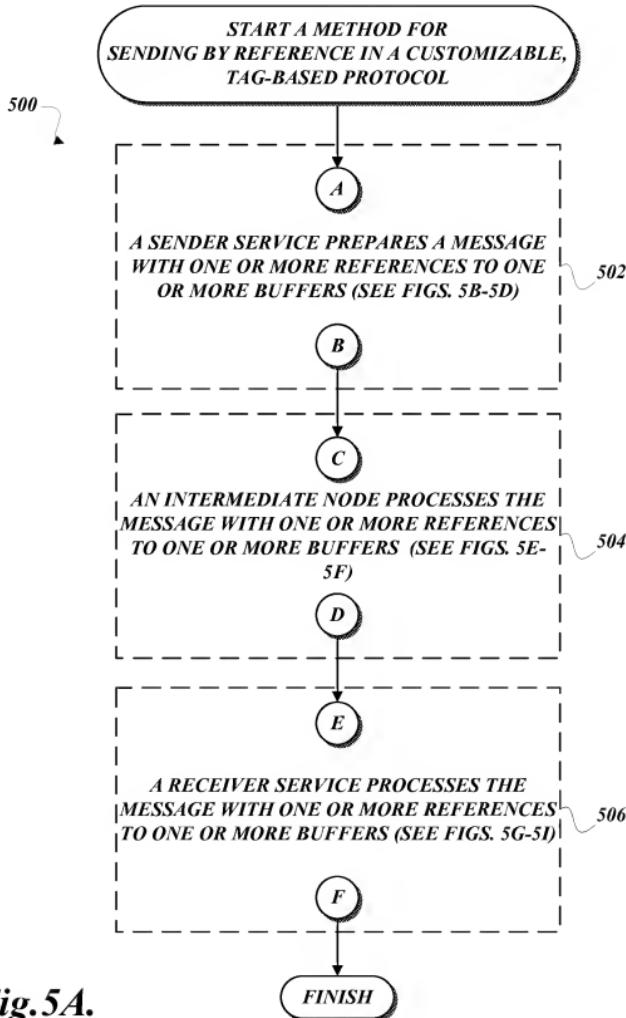A RNIC AND REQUESTS A STEERING
TAG — 520

(A1)

Fig.5B.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

10/16

500

(A1)

THE RNIC ASSOCIATES A STEERING TAG WITH THE ADDRESS OF THE LOCAL BUFFER AND RETURNS THE STEERING TAG ALONG WITH A NETWORK PORT NUMBER — 522

THE SESSION MANAGER CREATES A SESSION SERVICE WITH A URI WHICH CAN PROVIDE A TRANSFER CONTEXT (TO BE CREATED) — 524

THE SESSION MANAGER CREATES A TRANSFER CONTEXT, WHICH RELATES THE STEERING TAG WITH THE ADDRESS OF THE LOCAL BUFFER — 526

THE SESSION SERVICE IN ESSENCE REPRESENTS THE LOCAL BUFFER ALLOWING OTHER SERVICES TO QUERY FOR META DATA INFORMATION, SUCH AS THE TRANSFER CONTEXT — 528

THE SESSION MANAGER ISSUES A CREATE TRANSFER SESSION RESPONSE TO THE SENDER SERVICE (ALONG IS SENT THE URI OF THE SESSION SERVICE AND THE TRANSFER CONTEXT) — 530

THE SENDER SERVICE RECEIVES THE CREATE TRANSFER SESSION RESPONSE ALONG WITH THE URI OF THE SESSION SERVICE AND THE TRANSFER CONTEXT — 532

Fig.5C.

(A2)

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
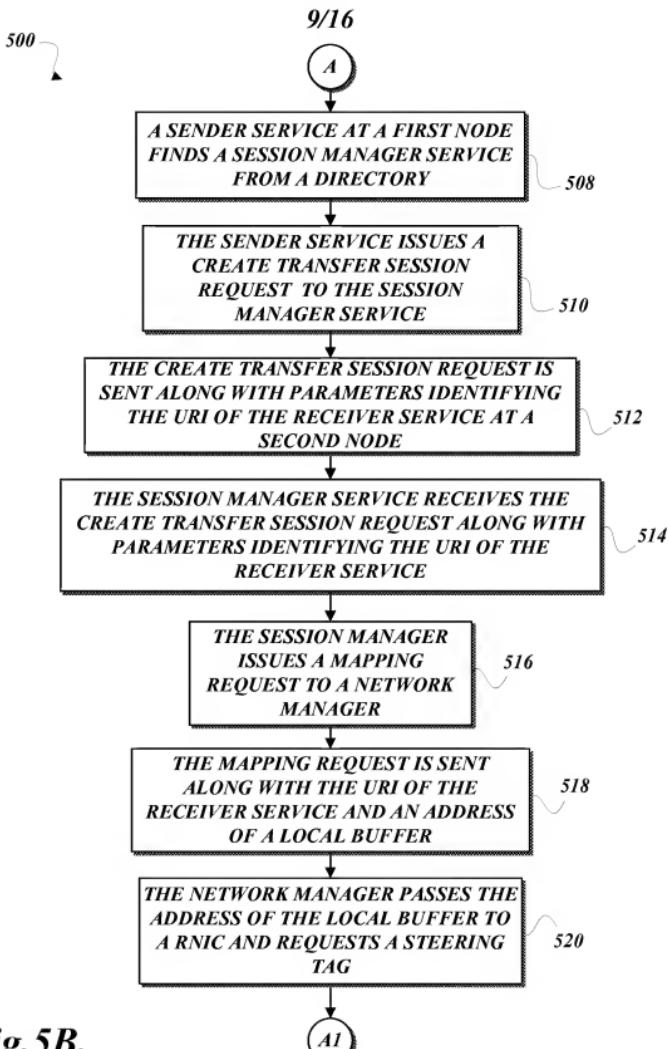Title: Send by Reference in a Customizable, Tag-based Protocol

11/16

500

(A2)

THE SENDER SERVICE CONSTRUCTS THE HEADER OF A SOAP MESSAGE TO CONTAIN THE TRANSFER CONTEXT INCLUDING THE URI OF THE SESSION SERVICE — *534*

THE SENDER SERVICE CONSTRUCTS AN ATTRIBUTE INDICATING A REFERENCE TO THE URI OF THE SESSION SERVICE — *536*

THE SENDER SERVICE CONSTRUCTS A BODY OF THE SOAP MESSAGE WHICH USES THE ATTRIBUTE TO DESCRIBE THE BUFFER — *538*

THE SENDER SERVICE OPTIONALLY ENCODES THE BODY OF THE SOAP MESSAGE TO SECURE FROM UNAUTHORIZED ACCESS — *540*

THE SENDER SERVICE SENDS AN UPDATE REQUEST ALONG WITH THE SOAP MESSAGE CONTAINING THE URI OF THE SESSION SERVICE — *542*

THE RNIC OF THE FIRST NODE SENDS THE SOAP MESSAGE (IN SERIALIZED FORM) ACROSS A NETWORK — *544*

Fig.5D.

(B)

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

12/16

(C)

500

IS THERE AN INTERMEDIARY THAT INTERCEPTS THE SOAP MESSAGE? 546

NO

(D)

YES

DOES THE INTERMEDIARY REQUIRE COMMUNICATION TO GO THROUGH IT ? 548

NO

(D)

YES

THE RNIC OF THE INTERMEDIARY RECEIVES THE SERIALIZED SOAP MESSAGE AND RECONSTITUTES IT 550

(CI)

Fig.5E.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

13/16

500

(C1)

THE INTERMEDIARY PARSES THE HEAD OF THE SOAP MESSAGE TO FIND THE TRANSFER CONTEXT — 552

THE INTERMEDIARY REPEATS PROCESSING STEPS 520-532 (FIGS. 5B-5C) BASED ON THE INFORMATION IN THE TRANSFER CONTEXT TO CREATE A STAGING BUFFER — 554

IS THE SOAP MESSAGE DELIVERING INFORMATION? — 556

NO

(C)

YES

THE CONTENT OF THE BUFFER OF THE PREVIOUS TRANSFER CONTEXT IS TRANSFERRED VIA RDMA INTO THE STAGING BUFFER OF THE INTERMEDIARY — 558

THE INTERMEDIARY CHANGES THE HEADER OF THE SOAP MESSAGE TO INCLUDE THE TRANSFER CONTEXT CREATED BY THE INTERMEDIARY — 560

THE RNIC OF THE INTERMEDIARY SENDS THE SOAP MESSAGE (IN SERIALIZED FORM) ACROSS THE NETWORK TOWARD THE DESTINATION — 562

(C)

Fig.5F.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
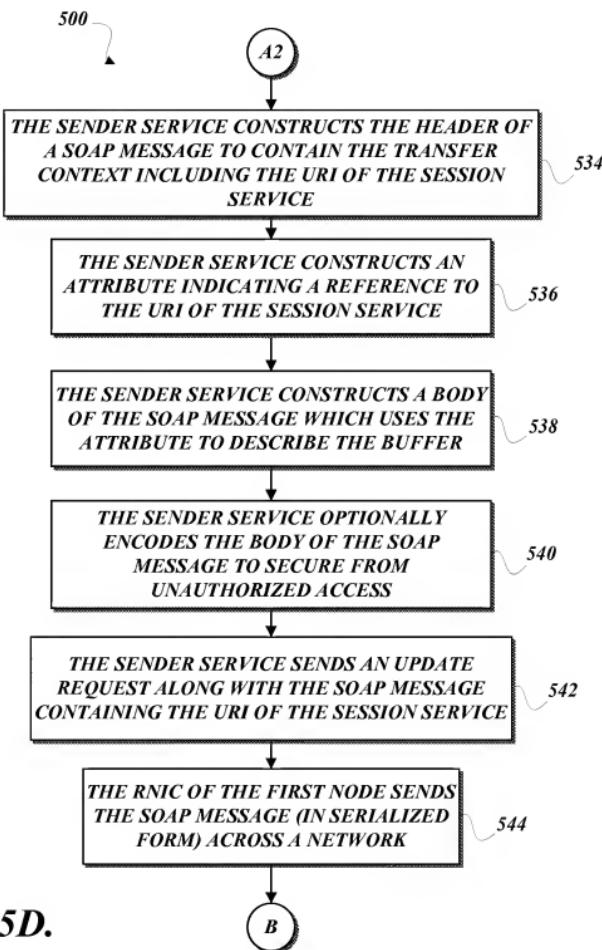Title: Send by Reference in a Customizable, Tag-based Protocol

14/16

500

(E)
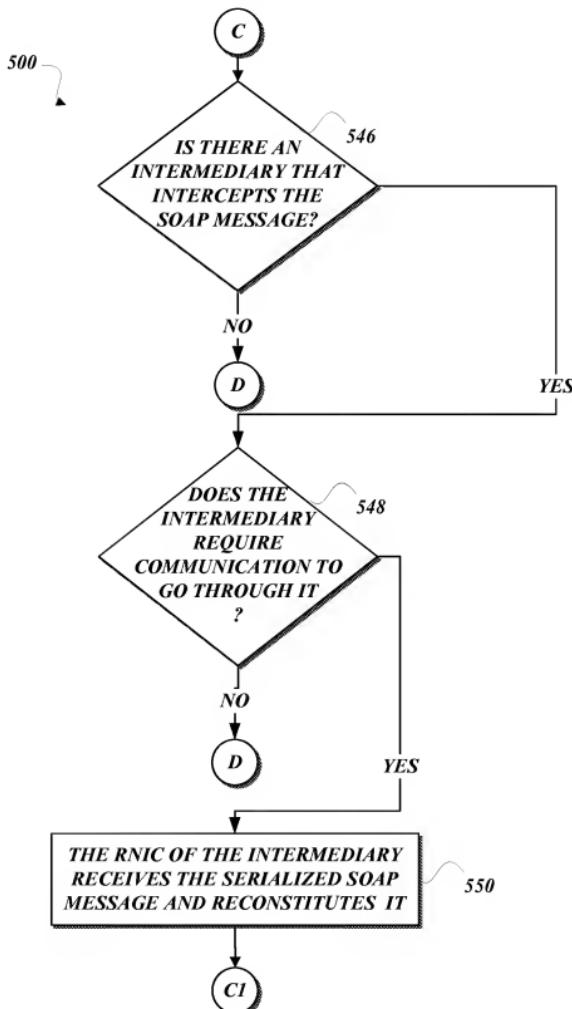
THE RECEIVER SERVICE AT THE SECOND
NODE RECEIVES THE UPDATE REQUEST AND
PARSES THE BODY OF THE SOAP MESSAGE — *564*

UPON ENCOUNTERING THE ATTRIBUTE IN THE
BODY, THE RECEIVER SERVICE FINDS THE
TRANSFER CONTEXT DESCRIBED IN THE HEADER — *566*

IS THE ACTION
ONE OF DELIVERING
INFORMATION? — *568*

NO

YES

THE RECEIVER SERVICE ALLOCATES A
LOCAL BUFFER BASED ON THE
INFORMATION IN THE TRANSFER CONTEXT — *570*

THE RECEIVER SERVICE LOCATES A LOCAL
BUFFER AT THE SECOND NODE
CONTAINING THE DESIRED INFORMATION — *572*

THE RECEIVER SERVICE ISSUES AN INSERT REQUEST TO
A SESSION MANAGER ON THE SECOND NODE (ALONG
WHICH IS SENT THE TRANSFER CONTEXT) — *574*

(E1)

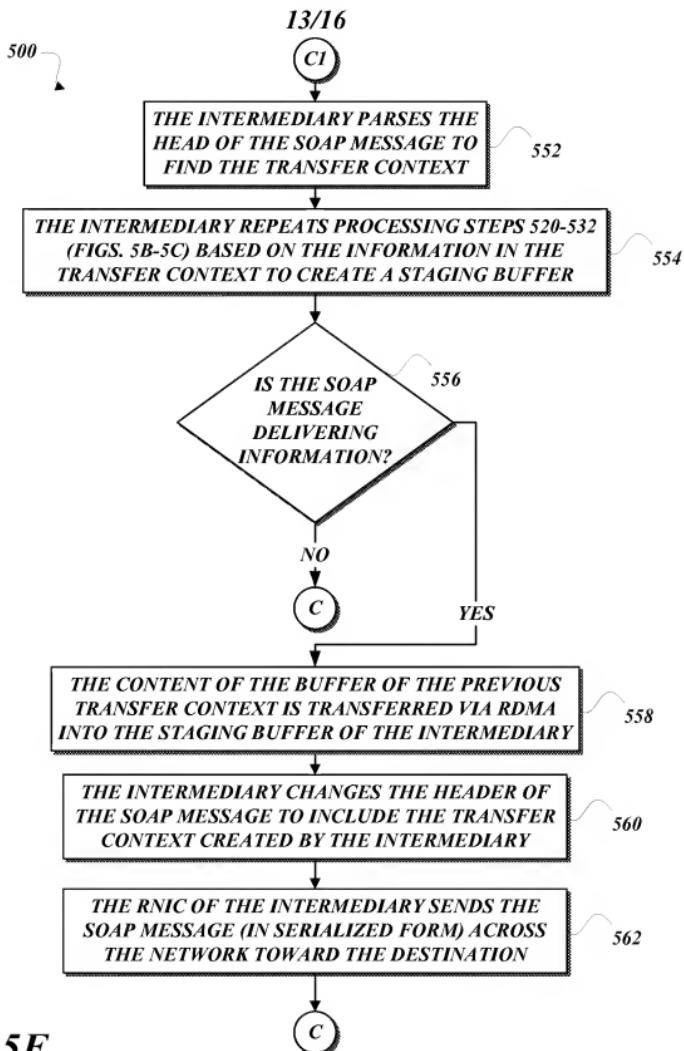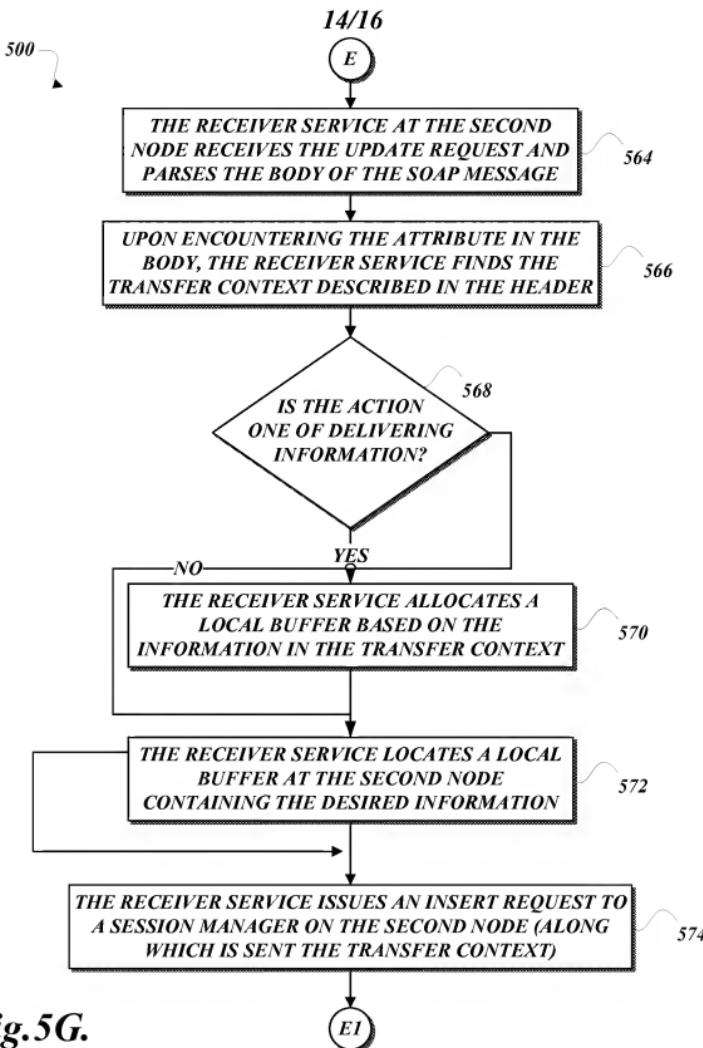*Fig.5G.*

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

15/16

500

(E1)

THE SESSION MANAGER RECEIVES
THE INSERT REQUEST AND PARSES
THE TRANSFER CONTEXT
576

THE SESSION MANAGER INVOKES THE NETWORK
MANAGER WHO IN TURNS COMMUNICATES WITH THE
RNIC TO TRANSFER INFORMATION
578

IS THE ACTION
ONE OF DELIVERING
INFORMATION?
580

YES

NO

THE RNIC AT THE OTHER NODE TRANSFERS
INFORMATION TO THE RNIC AT THE SECOND NODE
USING THE STEERING TAG IN THE TRANSFER CONTEXT
582

THE RNIC AT THE SECOND NODE TRANSFERS
INFORMATION TO THE RNIC AT THE OTHER NODE USING
THE STEERING TAG IN THE TRANSFER CONTEXT
584

AFTER TRANSFERRING HAS COMPLETED, THE
SESSION MANAGER ISSUES AN INSERT
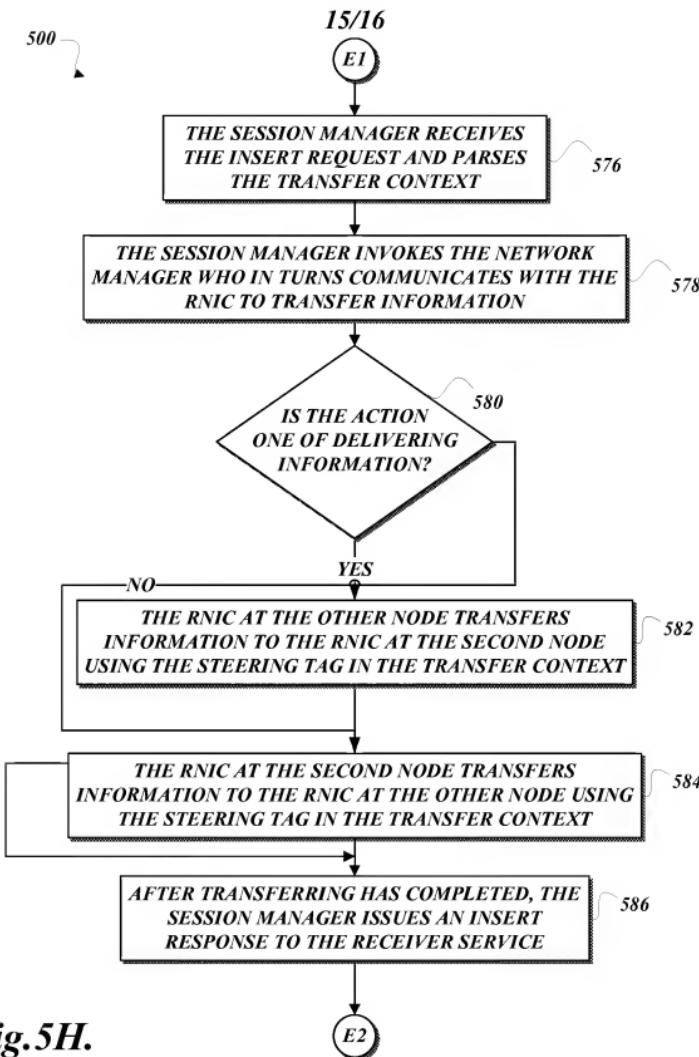RESPONSE TO THE RECEIVER SERVICE
586

(E2)

Fig.5H.

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
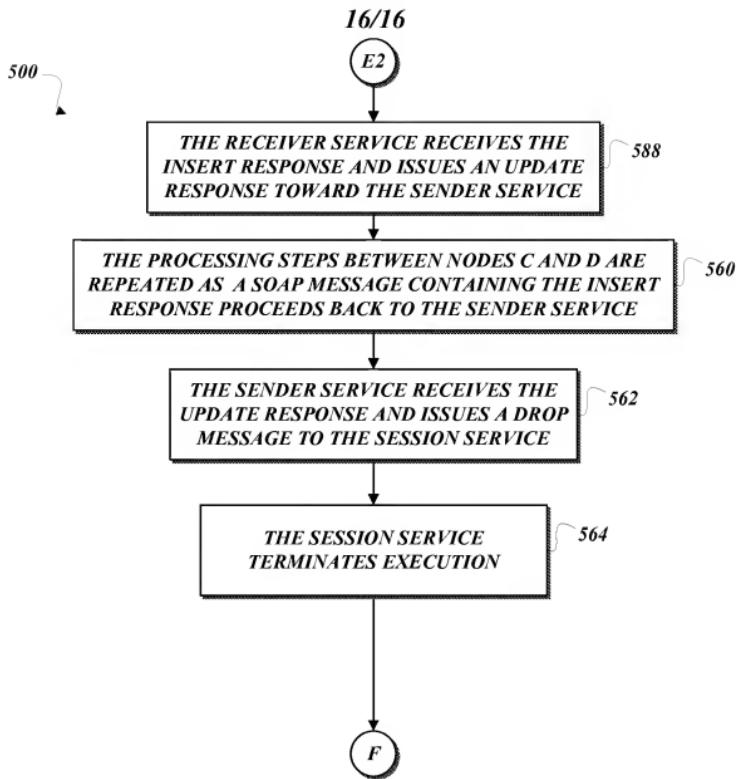Title: Send by Reference in a Customizable, Tag-based Protocol

16/16

500

(E2)

THE RECEIVER SERVICE RECEIVES THE
INSERT RESPONSE AND ISSUES AN UPDATE
RESPONSE TOWARD THE SENDER SERVICE   *588*

THE PROCESSING STEPS BETWEEN NODES C AND D ARE
REPEATED AS A SOAP MESSAGE CONTAINING THE INSERT
RESPONSE PROCEEDS BACK TO THE SENDER SERVICE   *560*

THE SENDER SERVICE RECEIVES THE
UPDATE RESPONSE AND ISSUES A DROP
MESSAGE TO THE SESSION SERVICE   *562*

THE SESSION SERVICE
TERMINATES EXECUTION   *564*

(F)

Fig.5I.